International Conferences on Science and Technology
Engineering Sciences and Technology
7-9 September 2022 in Budva, MONTENEGRO
ICONST EST 2022

Motivation for the Younger Generations Through Information and Communication Technology

Serghei Andronic[1], Nicolae Secrieru[1]*

Abstract: This paper deals with a challenge for the information and communication technologies (ICT). The main objective is to provide the target groups (children/young people, students, and PhD students) motivation, and opportunities to pursue careers in information and communication technology. Amongst specific objectives are: to enhance the promotion of research and technological achievements in this domain, among target groups; closing the gap in education programs used by schools and universities, related to information and communication science, by creating appropriate content (video lectures, on-line lectures) and implementation of information (competitions, summer schools, workshops); providing opportunities for pupil and student to develop their motivated ideas in science and information and communication technology; creation of courses on web platforms that integrate effectively promotion of research, achievements, results dissemination and efficient sharing of resources with online education target groups.
This paper presents how to teach, using the web, the components of an e-learning course website, and the structure of the instructional process. These learning environments will improve student performance in ICT courses offered at Technical University of Moldova ("TUM"). Our web-based instructional methodology focuses on teaching the systematic problem-solving skill. The development of courseware materials for student engineers in Republic of Moldova will have an increasing impact on the national scene of engineering education.

Keywords: computer-aided learning efficiency, information and communication technologies providing

1. Introduction

The open-source learning management systems ("LMS"), such as MOODLE, are platforms that allow users to build and offer online courses. It was built for traditional online classrooms, which attract a large number of students. Moodle is suited for organizations that want a full-featured, customizable LMS. The platform offers educational tools, analytics and SCORM compliance. The trade-off is that the platform is over 10 years old. The number of configuration options can be daunting, and system performance suffers with larger numbers of students. Our main objective is to provide the target groups (students and PhD students) motivation, and opportunities to pursue careers in information and communication technology. Amongst specific objectives are: to enhance the promotion of research and technological achievements in this domain, among target groups; closing the gap in education programs used by schools and universities, related to information and communication science, by creating appropriate content (video lectures, on-line lectures) and implementation of information (competitions,

[1] Technical University of Moldova, Space Technologies Center, Chisinau, Rep. of Moldova
* Corresponding author: nicolae.secrieru@cnts.utm.md

summer schools, workshops); providing opportunities for student to develop their motivated ideas in science and information and communication technology; creation of courses on web platforms that integrate effectively promotion of research, achievements, results dissemination and efficient sharing of resources with online education target groups. In order to make the training process more efficient, it is proposed to apply the blended e-learning approach. There are online courses on the TUM Moodle e-learning platform that reflect both the theoretical and practical part of communications, which are mandatory for students studying these disciplines. It is also accessible to other students who want to get acquainted with modern communication, including the satellite technologies.

2. Learning system structure on the TUM Moodle platform

A modular and hierarchical structure was incorporated in designing the organization of the learning system. Five levels were maintained to hierarchically structure the contents. The learning material was classified into modules at each level to ease the content and course management by providing flexibility for reuse. An example of such structure of the learning system is shown in Figure 1, based on the "Satellite communication" online course from TUM Moodle Platform [4, 6].

The structure resembles that of an academic curriculum. Each level can be compared to the levels in the traditional education system. The top level in the system structure was broadly divided into categories called "modules". This stage is similar to the different streams and majors in the academic curriculum that a student can take. As there may be different courses available in each stream that make them unique, the modules consist of

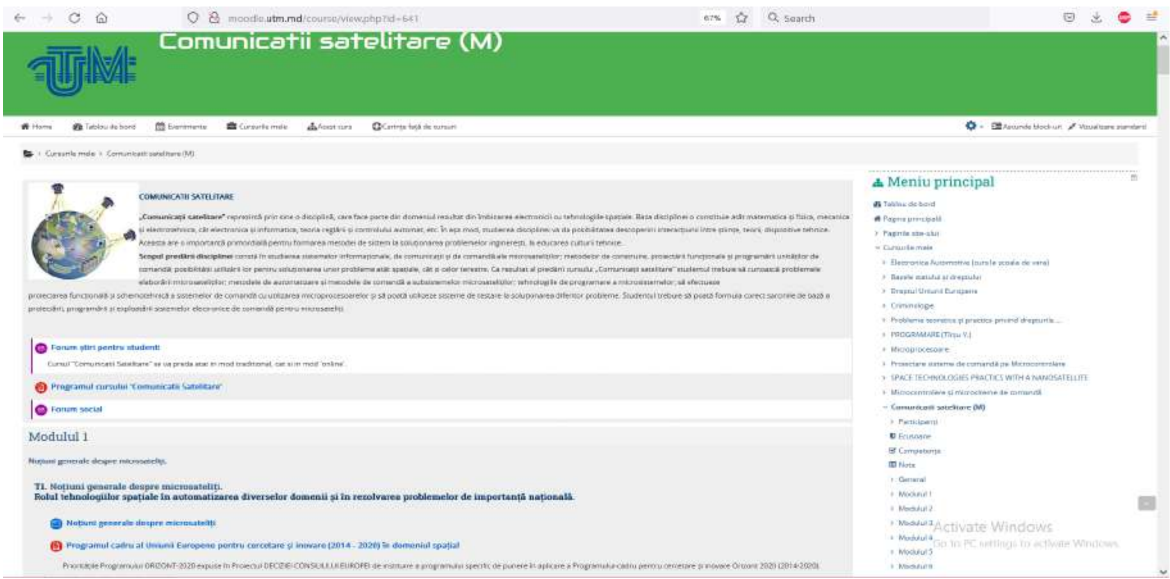

Figure 1. Learning System Structure

The lessons were further divided into "objectives" to provide a fundamental learning experience for the students, with explicit material focusing on specific topics. These objectives, which are the building blocks for the entire learning system, are comparable to the different chapters in a textbook used for a course. The last level in the learning system represents the content organization and presentation for each objective. The contents for the objective were displayed by segregating into frames. This level in the system is similar to the pages of each chapter in the textbook. As each chapter may vary in the number of pages, the objectives were also designed to vary from 1 to 20 frames depending on the volume of content. Though each frame displayed specific content, they were made self-contained in a single environment for an objective. This was done to maintain continuity in learning and minimize waiting time to load each frame. This frame-based structure was designed to display small chunks of material and help the user to grasp concepts gradually before proceeding to the next one.

3. Mobile and Satellite Communication course organization

The course organization is based on Bloom's taxonomy of education objectives, applied to e-learning of Mobile and Satellite Communication [1, 4]. As engineering curricula and courses continue to be restructured due to emerging technologies and ideas, it has become difficult to decide what body of knowledge should be retained and what is to be left out, given that the length of time for undergraduate education is limited to four years.

The choice of using e-learning technologies should also include the commitment to assess the course content, the learning outcomes, and interaction needs. These are also known as the "Five I's" of effective e-learning: interaction, introspection, innovation, integration, and information. Interaction refers not only to the communication that should occur between the student and the teacher, or the student with other students, but also the interaction between the students and the content of the course. Thus, asynchronous, and synchronous communications as well as the presentation of print materials and links to the Internet form the technology needs of interaction. Introspection is the interpretation, revision, and demonstrated understanding of concepts. Discussion boards and graphics can be effective technologies to encourage introspection. Innovation refers to the ability of teachers to experiment with technologies in order to address various learning styles. Thus, combination of audio, video, and asynchronous discussion can provide various opportunities for students to learn. Integration reflects the integration of facts, concepts, theories, and practical application of knowledge. Using case studies, print exercises, and role-play can create a setting in which integration can occur. Information refers to the knowledge and understanding that is a prerequisite for students to move to the next level of learning [1,4].

The instructional objectives provide the basis for instructional activities in and outside of the classroom/laboratories. For each class, the students come in with different learning styles and capabilities. Variation in learning styles of the students can be addressed through course organization. Today, the course organization is generally at the prerogative of the teacher who teaches the course. However, there is a general consensus and effort is being mounted by all faculty members to adapt instructional techniques that enhance student learning in and out of the classroom. It is therefore the teacher who is required to take into consideration the different learning styles, in order to build the class presentations around a combination of pedagogical techniques, so as to accommodate all the students enrolled in the course.

Shown in Table 1 is a sample of course objective for mobile and satellite communication. It is obvious from the objectives that this is not a traditional first circuit course in a typical communication engineering program. Also noteworthy is that only the first two sets of objectives are written out in detail. As a rule, the objectives indicate things that the student must be able to do at the end of the course.

Table1: Sample Instructional of the mobile and satellite communication

Objectives	**Contents of lessons**
To know: - main definitions of communications satellite; - classification and	T4. Satellite communications. T4.1 Development of satellite systems. Types of orbits Space system components: space segment; the terrestrial segment; user segment. Modes of communication

generations subsystems of satellite communications. Be able to: - to know the structure hardware and software communication systems for satellites; - to determine the mode needed for solving concrete problems of communication; - to know the functions of various communication subsystems.	between segments of space systems. Recommendations for the implementation of the microsatellite communication subsystem (continuous use of "beacon", use of common modes for amateur radio, verification of the possibility of monitoring the satellite at the launch stage with other ground stations). T4.2 Digital communication techniques. Techniques that allow basic band signals to be transmitted remotely, to adapt the characteristics of the signals transmitted to the constraints imposed by communications through satellite channels: power and bandwidth. The ways in which these resources can be traded from one another. Ways to achieve an optimal compromise, giving it maximum capacity at minimum system costs. Typical functions implemented for transmitting digital signals: processing or formatting tape; modulation and digital demodulation; encoding and decoding. Bit error rate (BER) per bit energy ratio and spectral power density (Ec / N0), power bandwidth trade-off due to the encoded channel.

It is pertinent to call the student's attention to the entries in the instructional objective Table 1. The writing of instructional objectives or course objectives is an elaborate exercise that takes a lot of time. Generally, the instructional objectives are divided into weekly activities and entered into the course calendar.

Some helpful strategies for establishing education objectives for on-line courses are:

a) Establishing online threaded discussions that deal specifically with assignments and projects;

b) Establishing course projects that:

- require problem finding and problem solving, not only the raw memorization of facts and information; and
- challenge everyday thinking to address diverse perspectives on issues.

c) Establishing learning outcomes that translate to and have lasting benefit to real-world practice.

d) Create conditions for a knowledge sharing community to emerge and create as many opportunities as possible for others to learn your infrastructure for knowledge sharing.

Motivation and opportunities for students and masters to pursue a career in information and communication science, including space science, can be successfully achieved by promoting research and technology achievements in information science, communications, and space technology and by actively involving them in a real scientific project with great impact.

In order to increase interest in information research, communication, space and satellite technologies, which in turn will positively influence the overall scientific performance of future and current students, TUM has set up several laboratories for the development of communication systems, created a space technologies center with the long-term goal of development, manufacturing and launching nanosatellites. On the other hand, it has concluded collaboration agreements with companies and operators of mobile and satellite communications to involve students in their real projects.

4. The study of the quality of blending learning

In order to establish the general level of motivation and satisfaction of students regarding the quality of blended learning, an extensive survey was conducted, in which the following aspects were addressed: the degree of satisfaction with reference to the quality of organized distance learning; focus on distance learning; prompt response to requests from teachers and colleagues; the degree of correspondence of the knowledge obtained with the expectations; the efficiency of teaching the material; the degree of difficulty of learning through the form of distance learning; the degree of qualification of teachers for distance teaching; the degree of ease of learning through the proposed teaching materials; the quality of the theoretical courses and the practical activities carried out at a distance; the duration of the individual study and the availability of further follow-up of this form of training [2, 3].

The applied questionnaire includes 11 questions with answers and 2 open-ended topics for the presentation of opinions and suggestions. The survey was conducted online, through the platform My University - Student, (https://utm.md/universitatea-mea/) between 27.04 - 28.05 2020 and 27.02.- 27.04.2021. The survey was completed by 870 (20.2%) and 608 (13.26%) students, respectively. The survey was implemented in the following conditions for teaching activities: fully online in the spring semester, academic year 2019/2020, in blended format (theoretical activities and some practical online activities, face-to-face laboratory work) for the autumn semester and fully online for the spring semester in the academic year 2020/2021.

We will present some comparative results of the survey conducted in the two rounds, highlighting the aspects of improvement and those suggested for the development of the blended form of distance learning: two topics, which address issues related to student expectations and perceived effectiveness of online teaching (figure 2,3).

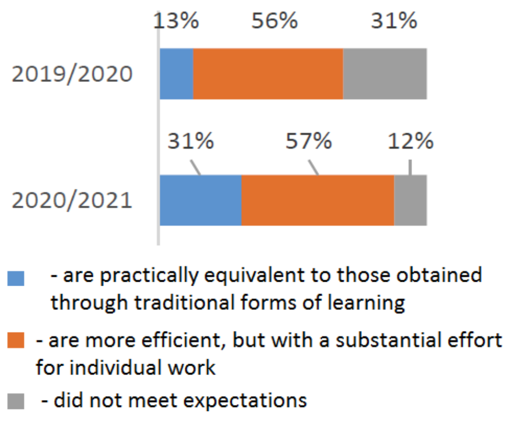

Figure 2. To what extent did the knowledge gained in the distance learning process met expectations?

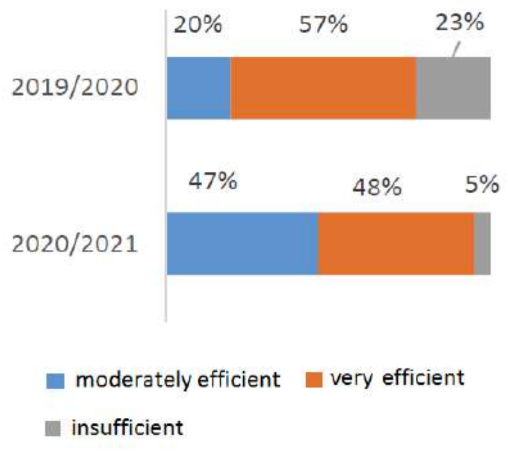

Figure 3. How effectively was the material taught through the form of blended learning?

Regarding the quality of the knowledge obtained in the academic year 2020/2021, 31% of the respondents mentioned that the knowledge obtained corresponded to the expectations, being registered a substantial increase of this quota of respondents (by 18%). The share of those dissatisfied with the knowledge obtained has decreased compared to a.u. 2019/2020 by 19%, and the number of partially satisfied remained relatively constant. In the same context, 47% of respondents believe that the material was taught efficiently, compared to 20% of the academic year 2019/2020, 48% consider that the learning material was taught moderately efficient, and 5% - not at all efficient, decreasing by 18% compared to academic year 2019/2020.

Conclusion

In order to motivate students for an effective acquisition of ICT material, it was proposed that the study activities be carried out in a mixed/blended way, through online courses, by applying pedagogical methods, but also methods and materials characteristic to traditional forms of teaching - face-to-face teaching and involvement of students in real projects.
For a real transition to the form of distance learning, but also the introduction of online training as a form of support for traditional forms of learning, the following directions of activity can also be summarized:

1. Selection of training strategies appropriate to the form of education, adapted to the general cycle and field of study and, of course, to the discipline taught.
2. Ensuring correct and effective learning for students. The form of online studies is focused on asynchronous activities, and this requires the reorganization of the informational content of the courses without affecting the scientific nature of the taught material.
3. Improving the scientific-teaching staff in the field of distance teaching methodology and designing teaching materials oriented towards this form of teaching. There were identified several key factors, including the quality and incompleteness of academic programs, the existing gap in scientific knowledge among schoolteachers, and the lack of information, motivation, environment, and opportunities for students regarding the science and technology. The implementation of the real project results will improve the quality of teaching by providing all study materials and imposing a study discipline for all forms of study, part-time studies, continuing education and full-time studies.

References

1. Adascaliţei Adrian , Secrieru Nicolae, Todos Petru. Running OER MOOC university courses by using moodle platform. - In: Procedeeng of Telecommunications, Electronics and Informatics, Chișinău, Moldova, 20-23 mai 2015
2. ANDRONIC, Serghei, BERNAZ, Luminiţa, TUTUNARU, Irina, BALAN Stela, MUNTEANU, Diana. The quality of distance learning during the Covid-19 pandemic in terms of student satisfaction (in Romanian). In: Journal of social science. ISSN 2587-3490/E-ISSN 2587-3504. Disponibil: https://jss.utm.md/wp-content/uploads/sites/21/2021/09/JSS-3-2021_10.52326jss.utm_.2021.43.04.pdf.
3. Institutional and didactic digital transformations for distance engineering education in the Republic of Moldova, (DIGIFORME) - Project code: 20.70086.23/COV (70105) https://www.asm.md/la-academia-de-stiinte-au-avut-loc-audierile-publice-ale-proiectelor-privind-combaterea-si.
4. Mobile and satellite communications - lecture course and course project - http://moodle.utm.md/course/view.php?id=641
5. Secrieru, Nicolae; Candraman, Sergiu; Andronic, Serghei; Younger generation inspiration and motivation through exposure to space technology - In: Proceedings of the conference "Telecommunications, Electronics and Informatics", Chisinau, Moldova, May 20-23, 2015
6. Space technologies practics with a nanosatellite - Mobile and Satellite Communications practice and labs course - http://moodle.utm.md/course/view.php?id=494
7. Todos, P., Secrieru, N., Guvir, S. Architecture of interuniversity's digital network in applied Science themes and economics in Moldova «CRUNT» - In: The 9th International Scientific Conference eLearning and software for Education, Bucharest, April 25-26, 2013, pag.333..338.